

Understanding Children's Total Dietary Exposure to Pesticides

Jeffrey Morgan, Craig Bernard, Lisa Jo Melnyk

Office of Research and Development (ORD)/National Exposure Research Laboratory (NERL)/Microbiological and Chemical Exposure Assessment Research Division (MCEARD)/ Chemical Exposure Research Branch (CERB)

Background

Through a series of collaborations with industry, academia, and other federal agencies, U.S. EPA is investigating the influence of eating activities on children's total dietary exposure to pesticides.

Results from recent residential monitoring studies demonstrated that a significant portion of total exposure of infants and children in homes sprayed with pesticides comes from food contamination.

Children's foods become contaminated through handling and contact with surfaces.

Collaborative Studies

1. Children's Lead Study

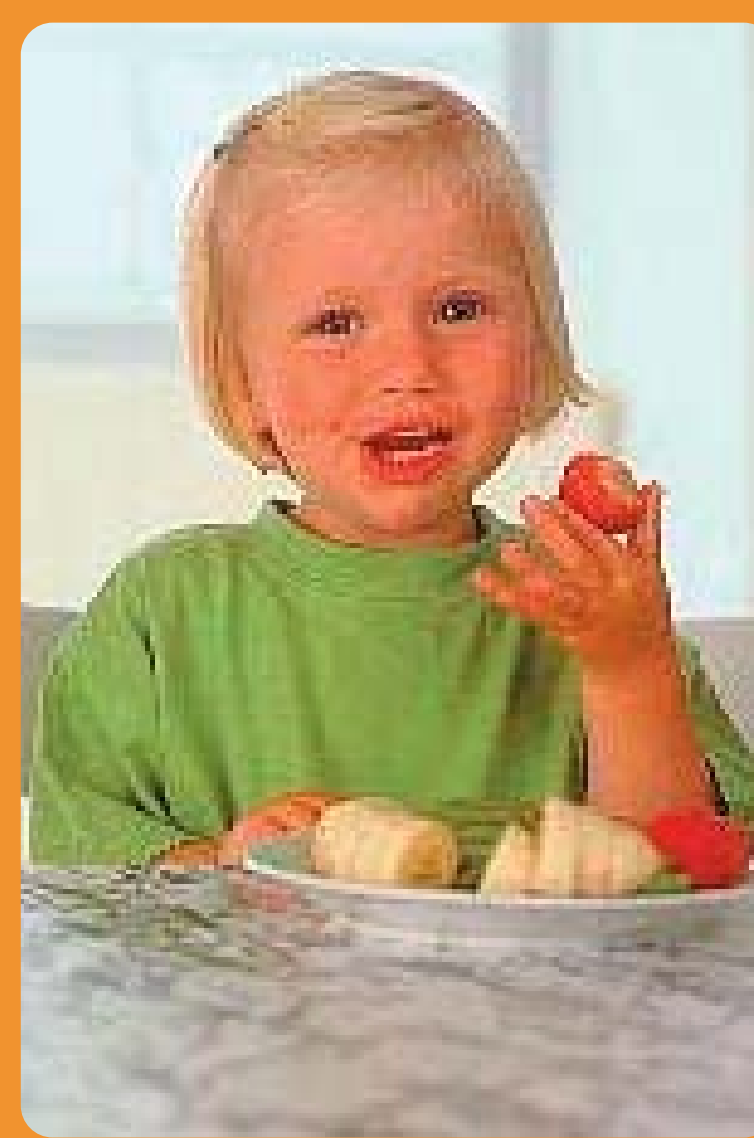
Objective - to accurately measure children's total dietary exposure to lead

Collaborators - University of Medicine and Dentistry of New Jersey, Environmental and Occupational Health Sciences Institute and Research Triangle Institute

Project Description - to establish the relationship between elevated blood lead levels of children living in lead contaminated homes and excess dietary exposures caused by eating activities that increased dietary lead intake

Outcomes -

- produced preliminary tools for collection of dietary exposure information
- quantified dietary intake of children including excess exposures from activities and unstructured eating habits
- demonstrated the potential importance of excess exposures
- laid foundation for developing refined methods to more accurately quantify dietary intake of young children
- developed deterministic model, the Children's Dietary Intake Model (CDIM), to identify the critical parameters needed to accurately assess dietary intakes of young children



4. Quantitative Pesticide Exposure Assessment

Objective - to understand the origins of pesticide contamination among young children in order to design effective, age-appropriate interventions

Collaborators - University of California - Berkeley, Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS)

Project Description - to characterize the sources, pathways or degree of children's exposure to pesticides in home environments in the Salinas Valley area

Outcomes -

- developed analytical methods for organochlorine, organophosphate, and other pesticides in dietary samples
- collaborated on protocols for collecting dietary samples
- other outcomes to be determined

2. Transfer Studies

Objective - to develop a reproducible sampling procedure that can be used to generate transfer efficiency for predicting exposure using the CDIM

Collaborators - Office of Pesticide Programs and National Center for Environmental Assessment

Project Description - to investigate variations in transfer due to differences in pesticide class, surface type, contact duration and sampling media

Outcomes -

- demonstrated food with high fat and moisture content have higher potential for contamination
- suggested extent of transfer is affected by food type and chemical properties of pesticide
- generated more accurate estimates of excess dietary exposure to infants and children in homes where pesticides are used
- demonstrated that alternative surface sampling (i.e., press sampler) is less effective than the traditional method (i.e., moistened surface wipes)
- demonstrated that pesticide transfer from hard surfaces is higher than from carpet



5. National Children's Study

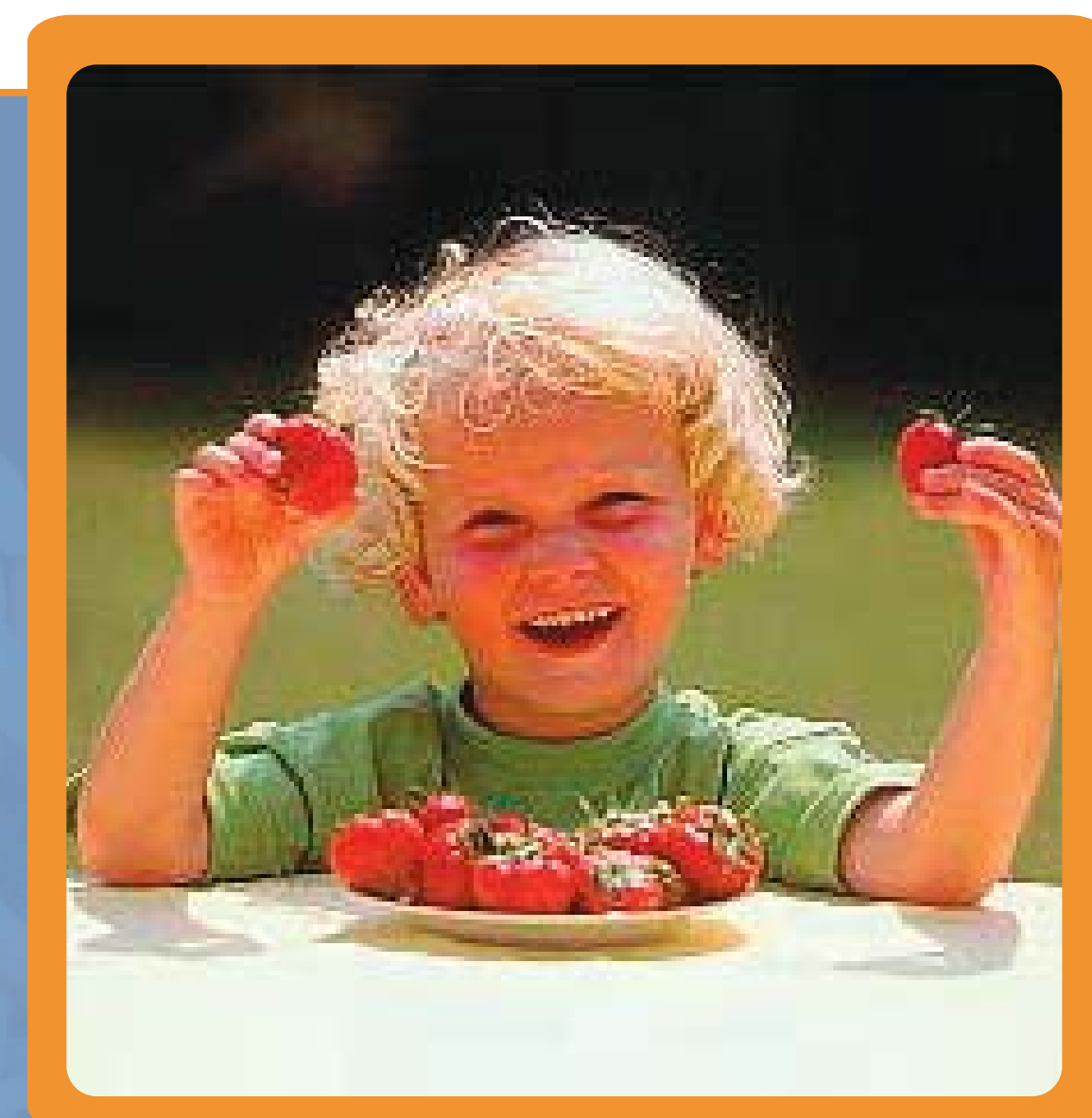
Objective - to form the basis of child health guidance interventions and policy

Collaborators - U.S. Department of Health and Human Services, National Institutes of Health and Centers for Disease Control and Prevention

Project Description - to examine the effects of environmental influences on the health and development of more than 100,000 children across the United States monitored from birth until age 21

Anticipated Outcomes -

- community based duplicate diet sampling (vs. traditional individual based duplicate diet)
- development of appropriate dietary questionnaires
- longitudinal dietary information



Submission #E1573, Photos by TSS & its Photographers

3. Children's Excess Dietary Intake Study

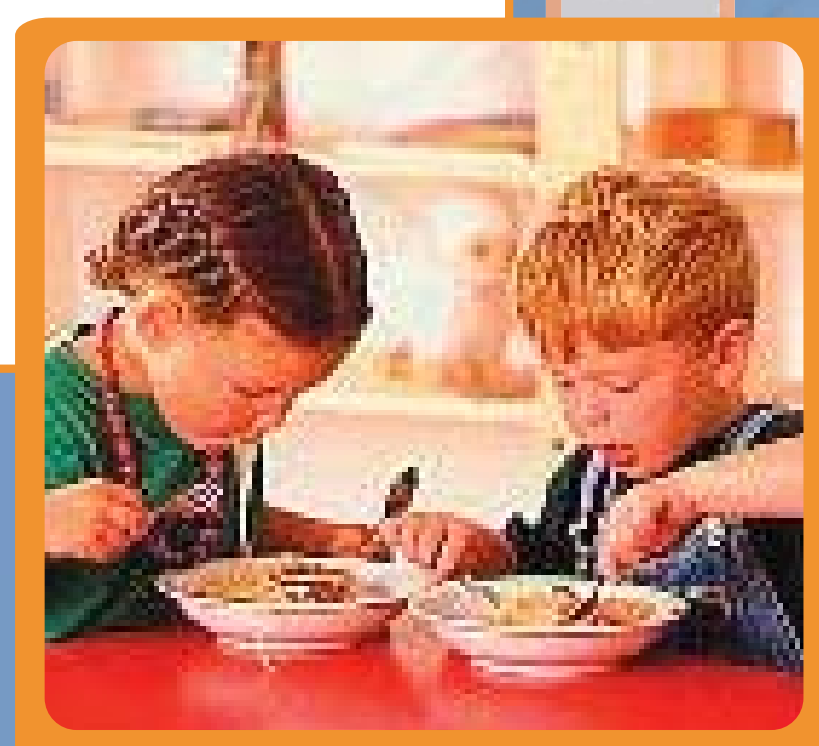
Objective - to test the efficacy of CDIM in a 3-home pilot study and to evaluate dietary exposure of 1-3 year old children living in homes recently sprayed with diazinon

Collaborators - University of Medicine and Dentistry of New Jersey, Environmental and Occupational Health Sciences Institute and Research Triangle Institute

Project Description - to evaluate predictability of CDIM by collecting food and urine samples following 1) longitudinal design of the study with alternating exposure status for the route/pathway of interest; 2) biomonitoring of selected chemicals with short biological half-lives; and 3) surface loading of the selected chemical at sufficient levels

Outcomes -

- dietary exposure to pesticides for a child is more than the intake of residues in/on foods
- biomonitoring of selected chemicals with short biological half-lives
- use of default (fixed) values for transfer efficiencies and activity factors results in poor estimates of dietary exposure using CDIM
- more accurate dietary measurements will lead to more realistic exposure assessments which in turn will result in improved assessment of children's risks to pesticides



Conclusion

These studies provide a better understanding of how children are exposed to pesticides via the dietary pathway. Overall, these collaborations provide a link between pathway-specific exposure research and comprehensive multi-agency exposure monitoring programs. Ultimately, improved understanding of children's exposure to pesticides via all routes will lead to improved risk assessments and, thus, healthier children.

Although this work was reviewed by the U.S. EPA and approved for publication, it may not necessarily reflect official Agency policy.



epascienceforum
Collaborative Science
for Environmental Solutions



2005
epa.gov/scienceforum